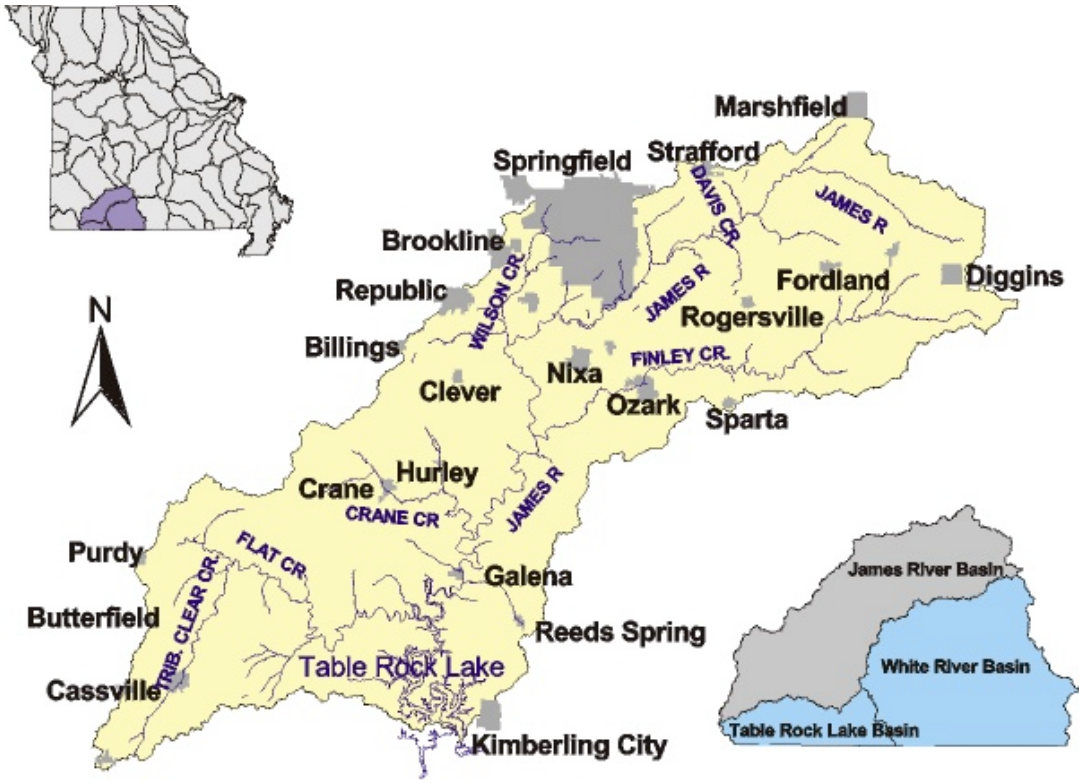
Department of Natural Resources
Division of Water Protection and Soil Conservation
Water Pollution Control Program
Basin Plan Facts

JAMES RIVER BASIN – 11010002



James River Basin HUC8 11010002

BASIN DESCRIPTION

The James River Basin includes all of the land drained by the unimpounded portions of the James River and all of its tributaries, an area of 1,512 square miles. Located in southwest Missouri, the James River flows nearly 100 miles from Webster County to its mouth in Table Rock Lake, an impounded section of the White River. Major tributaries of the James River within the basin include Crane Creek, Flat Creek, Finley Creek, Panther Creek, Pearson Creek and Wilson Creek Approximately 30 percent of the land cover within the James River basin is hardwood forest, 63% is agricultural and 7% is urban. Springfield is the largest city in the basin but population growth and land use changes from rural to urban are rapidly occurring south of Springfield into the areas of Nixa and Ozark. The town of Reeds Springs in the southern part of the basin is also experiencing significant population growth and land use change due to its proximity to Branson.
(http://www.conservation.state.mo.us/fish/watershed/whriver/landuse/390lut08.htm)

The basin geology is characterized by karst, terrain dominated by sinkholes, losing streams, caves and springs. The dominant surface rock formation in this basin, Burlington Keokuk limestone, is extremely weathered and has many areas of well-developed karst. Lying beneath the Burlington-Keokuk limestone throughout most of the basin is the Northview shale. This shale layer acts as an aquitard, a rock formation that retards the downward movement of water. In other words, where present, Northview shale can prevent shallow, easily-contaminated groundwater from infiltrating deeper groundwater used as drinking water supplies. By preventing deeper infiltration, the Northview shale forces shallow groundwater to emerge as seeps or springs along the valleys of larger streams where this rock formation is exposed. Thus, the highly developed karst in the basin results in frequent contamination of the shallow groundwater and loss of flow in many smaller streams in dry weather, but allows for maintenance of stream flow in larger streams.
(http://www.conservation.state.mo.us/fish/watershed/whriver/geology/390getxt.htm#gefg2)

WATER QUALITY CONCERNS

Water quality concerns include stormwater runoff from agricultural and urban lands and discharges from wastewater treatment plants. Primary pollutants of concern include phosphorus, a plant nutrient contributing to heavy algal growths in James River and eutrophication in Table Rock Lake, and potentially toxic chemicals originating from the Springfield metro area. Within the past few years occasional problems with inadequate disinfection at wastewater treatment plants has led to bacterial contamination of Wilson's Creek, James River and Finley Creek.

Point source pollution is a discharge of contaminants from a single location such as a wastewater treatment plant. These wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. There are 42 permitted wastewater treatment facilities in the James River Basin, generating over 47 million gallons of wastewater daily. The largest wastewater discharge in this basin, Springfield Southwest Wastewater Treatment Plant, generates 42.5 million gallons per day. This is approximately 90% of the total volume of wastewater in the basin. Effluents from sewage treatment facilities enter streams at several other locations as well. Most discharges affect less than 0.1 mile of the receiving stream. However, five miles of Wilson Creek are believed to be affected by discharge from the Springfield Southwest Wastewater Treatment Plant, and about one mile of Railey Creek in Stone County is believed to be affected by the Reeds Spring Wastewater Treatment Plant. Contaminants of concern include; 1) nitrogen and phosphorus which can stimulate excessive algal growth, 2) bacteria, which can present health risks for swimmers and 3) biological oxygen demanding substances, which can lower dissolved oxygen levels in streams or lakes.

Nonpoint source pollution is waste that is not released from a specific, identifiable point, but from numerous points that are spread out and difficult to identify and control. Significant nonpoint sources of nutrients such as nitrogen and phosphorus would include stormwater runoff from cattle pastures, dairies, and poultry growing operations. These nutrients plus heavy metals and toxic organics also occur in stormwater runoff from urban areas. Other potential nonpoint sources include sedimentation from erosion in disturbed watersheds, sludge application from sewage treatment facilities, coal pile runoff, stormwater runoff from mining sites, and seepage from septic tanks. Infiltration of nonpoint source pollutants via karst into groundwaters has caused widespread contamination of the shallow groundwater aquifer and more localized contamination of the deep aquifer which is used for drinking water.

Water quality can be influenced by the amount of stream flow. During periods of heavy rain or snowmelt, surface runoff can increase stream flows dramatically, and the effect of this increased water volume from surface runoff can change water chemistry. In most watersheds, increases in flow due to stormwater runoff usually cause some increase in nitrogen, phosphorus, suspended solids (usually small soil particles), and bacteria levels in streams. Since stormwater runoff does not infiltrate into the subsurface, it has less chance to dissolve earth minerals and as a result, has fewer dissolved minerals (expressed as a lower electrical conductivity) than water in streams during low flow periods. These water quality flow relationships are apparent in rural streams in Table 1 below. For urban streams that carry a large point source wastewater load, nitrogen and phosphorus can be higher at low flows because the levels of these pollutants in wastewater is higher than in stormwater runoff.

Table 1: Typical Water Quality at High and Low Flows – James River and tributaries

Stream	pH	Conductivity	Ammonia N	Nitrate N	Total Phosphorus	Fecal Coliform Bacteria	Total Suspended Solids
		Micromhos/cm	mg/l	mg/l	mg/l	colonies/100ml geometric mean	mg/l
Panther Creek near mouth							
High Flow	8.1	254	Not Available	0.81	0.009	583.80	57.7
Low Flow	8.0	334	Not Available	0.88	0.010	68.49	3.8
Sawyer Creek near mouth							
High Flow	7.9	257	Not Available	1.50	0.035	358.46	69.0
Low Flow	8.1	351	Not Available	1.13	0.024	97.63	3.4
Turner Creek near mouth							
High Flow	7.9	275	Not Available	2.71	0.012	53.58	1.4
Low Flow	8.2	371	Not Available	3.00	0.014	73.48	4.2
Pearson Creek near mouth							
High Flow	7.8	366	Not Available	2.21	0.024	75.91	92.0
Low Flow	7.8	464	Not Available	2.22	0.010	59.59	5.3
James River at Nelson Mill							
High Flow	8.0	252	Not Available	1.27	0.31	174.55	Not Available
Low Flow	7.8	377	Not Available	1.07	0.48	83.10	Not Available
Wilson Creek upstream of Southwest WWTP							
High Flow	7.7	521	0.21	2.09	0.490	223.87	Not Available
Low Flow	Low flow data not available						
Wilson Creek downstream of Southwest WWTP							
High Flow	7.4	1004	3.73	10.82	3.490	524.81	Not Available
Low Flow	7.6	1127	1.59	16.52	5.400	50.12	Not Available
James River at Boaz							
High Flow	7.7	352	0.09	1.87	0.210	2014.57	Not Available
Low Flow	7.8	561	0.05	3.81	0.840	100.90	Not Available
Finley Creek near mouth							
High Flow	8.2	239	Not Available	1.25	0.380	204.58	Not Available
Low Flow	8.1	348	Not Available	1.05	0.350	76.27	Not Available

Table compiled from Springfield Utilities and Public Works data

The amount of phosphorus being delivered to Table Rock Lake via the James River basin is of major concern. Excess phosphorus is a cause of eutrophication, the nutrient enrichment of an aquatic ecosystem that promotes the growth of algae. Table Rock Lake has shown increased levels of phosphorus and declining water clarity over the last two decades. Table 2 estimates the phosphorus load to Table Rock Lake by various sources.

Table 2: Estimated Daily Phosphorus Loading into Table Rock Lake by Source Category

Sources of Phosphorus Loading	Phosphorus (Lbs./Day)
Point Sources	
Upper James River including Springfield SW WWTP	**622**
Kings River including Berryville, AR	12
Other Point Sources >5 mi. from Table Rock Lake	31
Other Point Sources <5 mi. from Table Rock Lake	10
Nonpoint Sources	
Upper James River (above Boaz)	345
Kings River above Berryville	274
All other watersheds	910
Total Point Source Load	**675**
Total Nonpoint Source Load	**1529**

WATER QUALITY MANAGEMENT

Concerns about eutrophication in Table Rock Lake and the James River have resulted in a new regulation by the Department of Natural Resources that limits the amount of phosphorus in wastewater discharges. Prior to this rule, typical phosphorus levels in wastewater discharges were about 3 mg/l. This new regulation states that discharges to the Table Rock Lake watershed shall not exceed 0.5 mg/l phosphorus as a monthly average. All new discharges must be designed to comply with these guidelines. Existing discharges with a design flow of 1.0 million gallons per day or greater must comply within four years. Existing discharges with a design flow of 0.1 million gallons per day to 1.0 million gallons per day must comply with an effluent limit of 1.0 mg/l of phosphorus as a monthly average within 4 years. In addition, these facilities must comply with the 0.5 mg/l phosphorus limit as a monthly average within eight years. Existing discharges with a design flow of 22,500 gallons per day to 0.1 million gallons per day must comply to an effluent limit of 0.5 mg/l phosphorus limit as a monthly average within eight years.

RELATED SITES

Missouri Department of Conservation – Missouri's rivers and Their Watersheds

United States Geological Survey – Water Use in the United States

United Staates Geological Survey – Ozark NAWQA Study

CARES Watershed Information Clearinghouse – Water Resources Atlas

City of Springfield, Missouri – Sanitary Services